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ABSTRACT

The purposes of this paper are a) to present tentative statements based upon a synthesis of the research in the area of interdisciplinary education, b) to present some implications for professional behavior based upon these tentative statements, and c) to present some testable questions which need to be researched in order to solidify or modify these implications. The characteristics and analysis of the activities of the interdisciplinary approach are presented for clarity. Dissertation abstracts were treated as primary sources of data; however, the content is primarily the applicable findings rather than a critique of the material. Following the literature review are three sections: the research summary containing the research synthesis and its tentative statements; implications derived primarily from the statements; and recommendations for future research. The research summary indicated the following findings: 1) the self-concept of learners exposed to interdisciplinary approaches was higher than those who were exposed to the disciplinary approach; 2) those with the interdisciplinary approach were found to be more independent, assertive, motivated, and involved than those exposed to the disciplinary approach; and 3) those exposed to the interdisciplinary approach also used better and more varied approaches to problem solving and made better uses of their available resources. A 25-item bibliography is included. (MJM)

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Consumer's Report

on

THE COMPARATIVE EFFECTIVENESS OF INTERDISCIPLINARY APPROACHES

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A Search for Empirical Data Which Supports or Rejects The Application of Interdisciplinary Knowledge, Methods, Materials, and/or Apparatus in The Pursuit of Classroom Learning

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THE COMPARATIVE EFFECTIVENESS OF INTERDISCIPLINARY APPROACHES

Statement of Purpose

The purposes of this paper are:

(1) to present tentative statements based upon a synthesis of the research in the area of interdisciplinary education

(2) to present some implications for professional behavior based upon these tentative statements

(3) to present some testable questions which need to be researched in order to solidify or modify these implications.

Rationale for an Interdisciplinary Approach

Charges against traditional education (Purcell, 1969) have repeatedly indicated its failure to meet contemporary needs. Deficiencies mentioned include fragmentation of disciplinary content, of human effort, of failure to understand the interrelationships among disciplines and between man and his environment. An examination of the trends toward a wholistic point of view leads to an affirmation of the inextricable wholeness of the learner and his relationship to his total environment (Dale, 1965). Dale's study proceeded from a chronological investigation of wholeness and fragmentation in their most general and theoretical forms. Philosophical meanings and implications were explored as well as current theory and practice in a wide range of disciplines.

In essence, the dissemination of knowledge by disciplines tends to fragment. And fragmentation tends to produce meaninglessness. Too often no attempt is made to relate, to show how the bits and pieces from the various knowledge structures dovetail into a coherent whole or unistructure. Fragmentation, or lack of relatedness, contributes to general chaos and confusion. A prescribed antidote is the development of wholistic or comprehensive outlooks: being able to find, at will and if desired, functional and/or purposeful places for all ideas, all things, and all persons in the total scheme of things. An interdisciplinary approach to the educational processes, then, should serve to reduce fragmentation, reduce chaos

and confusion; should increase meaningfulness, comprehensiveness, and harmony. In turn, the individual learner who is subjected to such an approach should become increasingly more self-reliant, more productive, and more autonomous.

Until very recently the term "interdisciplinary approach" seemed to have little to do with the actual classroom learning processes. It was generally defined as a method of study by which "experts" from diverse knowledge structures (disciplines) came together in the examination of a particular problem that was relevant to all their fields of specialization. The inherent theory, presumably, is applicable when an individual attempts to solve his own particular and peculiar problems. An individual is an "expert" in proportion to the degree that he is knowledgable in a particular realm of knowledge. If he possesses knowledge or "know-how" in several realms (knowledge structures or disciplines) and can inter-relate the respective concepts and principles, then can apply or make use of the entwining, his approach to reaching his objectives, or solving his problems may be said to be interdisciplinary. Essentially, this is the way most mature people, at least, function. Real life is "interdisciplinary". People use a succession of different kinds of knowledge and different skills as a means of solving their problems or for reaching goals or objectives.

The foregoing is the primary argument favoring interdisciplinary education. That which we do in our schools, the teaching and the learning processes, can be consistent with what happens in real

life. By the instillation of a sense of inter-relatedness---by deliberate acknowledgement and application and by deliberate advocation and dissemination---our products (that which we produce as a result of the educational processes) may become more self-reliant, productive, and autonomous. Here lies the goal of the interdisciplinary approach!

Site and Background Information

A Seattle Public Schools Interdisciplinary Committee in their final report made the following basic assumptions:

1. "that it is desirable to create an interdisciplinary curriculum
2. "that the curriculum will be based on the K-4 school learning processes, which will be sequential, continuous, and interdisciplinary
3. "that the upper level (high school) will be sequential, continuous progress within the disciplines, and although departmentalized, will offer and continue the interdisciplinary approach."

The report further indicated that a variety of interpretations of the term "interdisciplinary" exist: "shadings of meanings which give only token attention especially when put into action. A clarification is needed." Yet, this committee failed to clarify.

In the Spring of 1971 another Seattle Public Schools group prepared a document entitled "Middle School Interdisciplinary Education". In essence "interdisciplinary education" was explained as schooling at its best: reflecting the realities of life; using a succession

of different kinds of knowledge and different skills, not for their own sake but as a means of reaching the goals that really motivate people.

In the Fall of 1971 and soon after their respective arrivals at Seattle Public Schools' Model Middle School (currently known as South Shore Middle School) certified staff members were handed a planning folder which reads in part, "The middle school will not be departmentalized according to subject matter but will stress an interdisciplinary approach to curricula." At the time of this writing (February 1972) the approach seems to be more departmental or disciplinary-ized than interdisciplinary-ized. The approach---if there is an approach---is far from being interdisciplinary, in spite of the administrative dictum.

Statement of the Problem

Several possibilities exist as to why the interdisciplinary approach is not presently being pursued. Three of these possibilities have been explored and the findings are presented herein. The first is the simple lack of understanding as to what an interdisciplinary approach is supposed to be. An attempted clarification will be presented in the two sections entitled "Definition of Terms" and "Operational Definitions". The second is the lack of rationale for implementing such an approach. This has been presented in the section entitled "Rationale for the Interdisciplinary Approach". It was used as this paper's introductory statement. And the third is

skepticism: the lack of belief that the interdisciplinary approach is any more effective than any other approach. The section entitled "Review of the Literature" will present the research findings which bear upon effectiveness or lack of effectiveness.

Procedure

Most definitions will constitute the standard meanings for the respective terms. In addition "interdisciplinary approach" and "disciplinary approach" will be defined in considerable detail. Bits of definitive qualities have been extracted from various periodicals. Not one of these periodicals seemed to cover the entire scope.

Much of the rationale for the implementation of the interdisciplinary approach as a more effective means than the disciplinary approach, with the two exceptions cited, come from secondary sources.

The term, "interdisciplinary approach" seems to be a very contemporary one for much has been written about it recently. The Educational Resources Information Center index (ERIC) lists many descriptive articles, but very little evaluative information. The Psychological Abstracts make no applicable reference. Several selected related terms were discovered in the ERIC Thesaurus and in scanning the microfiche. Some of these terms, and the programs

to which they refer, do contain elements of "interdisciplinariousness". The ones that do were used conjunctively with the term "interdisciplinary approach" in searching the Dissertation Abstracts. These abstracts cite numerous studies which appear to be applicable. Preferably one would go directly to these dissertations for what evaluative data they might contain. Unfortunately, they are (with two exceptions: Gardner, 1958 and Watrous, 1956) available only through the inter-library loan services of the University of Washington. An alternative procedure was used: the Abstracts were treated as primary sources. The recognized difficulty here, is, of course, the invalidness of critiquing a synopsis. That which one critieizes may in fact have been adequately and appropriately handled somewhere in the total document. Therefore, attempts to critique will be limited. The content of the literature review will be primarily the applicable findings.

Following the literature review are three sections devoted to the paper's purposes: the Research Summary containing the research synthesis and its tentative statements; Implications derived primarily from the statements; and Recommendations for Future Research with some hopefully testable questions. The content of these three sections are influenced by the literature review, by assimilated concepts and principles derived from various printed sources and discussions, by empirical experience, and finally by reflection.

Characteristics of an Interdisciplinary Approach

A satisfactory, precise, and ready-made operational definition of the term "interdisciplinary approach" could not be found. However, a review of the literature, both primary and secondary, has revealed that an interdisciplinary approach may have one or more of several characteristics. The categorization of these several characteristics follow:

1. Determination and application of conceptions (concepts and principles) common to diverse knowledge structures (disciplines).

2. Application of a conception (concept or principle) from a diverse knowledge structure (discipline) within the context of a given structure.

3. Consideration and application of discovery and inquiry methods originating in diverse knowledge structures (disciplines).

4. Consideration and application of materials originating in diverse knowledge structures (disciplines).

5. Consideration and application of apparatus originating in diverse knowledge structures (disciplines).

6. Synthesization and application of concepts (concepts and principles) originating in diverse knowledge structures (disciplines) to form a coherent whole (new concept or principle).

7. Composition and application of a unistructure with constituents derived from diverse knowledge structures (disciplines).

Activity Analysis of the Interdisciplinary Approach

This section outlines the specific and possible activities of the user (person or persons) of an interdisciplinary approach. A user of an interdisciplinary approach will engage in one or more of the activities which are outlined below.

A. Acknowledges Common Conceptions and Generalizations
   1. Deliberately determines concepts and principles common to diverse knowledge structures.
      a. Compares structure by structure to discover commonalities
      b. Categorizes commonalities
   2. Deliberately applies concepts and principles common to diverse knowledge structures
      a. Transfers meaning found in diverse discipline to given discipline for abstract interpretive purposes
      b. Transfers meaning found in diverse discipline to given discipline for concrete or performance purposes
   3. Intermittently and/or occasionally applies concepts and principles common to diverse knowledge structures
      a. Transfers meaning found in diverse discipline to given discipline for abstract interpretive purposes
      b. Transfers meaning found in diverse discipline to given discipline for concrete or performance purposes

B. Acknowledges Uniqueness of Methods
   1. Deliberately considers methods unique with or originating in a diverse structure as a possible strategy for use within a given structure
   2. Deliberately applies methods unique with or originating in a diverse structure as a strategy within a given structure
   3. Intermittently and/or occasionally applies methods unique with or originating in a diverse structure as a strategy within a given structure

C. Acknowledges Uniqueness of Materials
   1. Deliberately considers materials unique with or originating in a diverse structure for application within a given structure

2. Deliberately applies materials unique with or originating in a diverse structure within a given structure
3. Intermittently and/or occasionally applies materials unique with or originating in a diverse structure within a given structure

D. Acknowledges Uniqueness of Apparatus
1. Deliberately considers apparatus unique with or originating in a diverse structure for application within a given structure
2. Deliberately applies apparatus unique with or originating in a diverse structure within a given structure
3. Intermittently and/or occasionally applies apparatus unique with or originating in a diverse structure within a given structure

E. Acknowledges Synthesis
1. Deliberately entwines (mentally) concepts and principles from diverse disciplines
2. Deliberately fabricates and constructs using derived concepts and principles
3. Occasionally and/or intermittently combines concepts or principles derived from diverse disciplines
4. Occasionally and/or intermittently fabricates and constructs using derived concepts or principles

F. Acknowledges the Existence of Unistructure
1. Deliberately composes a single knowledge structure in which the concepts and principles contained are derived from the traditional disciplines or knowledge structures
2. Deliberately applies concepts and principles derived from diverse disciplines as needed
3. Accidentally or automatically applies concepts and principles derived from diverse disciplines as needed
4. Deliberately applies concepts and principles without reference to disciplines as needed

Definition of Terms

Most educators are familiar with the terms "subject-oriented" and "child-centered"; "self-contained"; "departmental"; "core"; "correlated curriculum" and "integrated curriculum". However, only recently have some been exposed to the term "discipline" as it relates to knowledge structure and realms of meaning. Both because of the recent exposure and because many of the above terms, along with several others, fall within the scope of knowledge-relatedness, or relative absence of it, some definitive action is necessitated herein. Definitions follow:

Broad-fields curriculum: A curriculum built around a small number of major areas of study that are constant for all pupils; represents a reaction to the provision of a multiplicity of separate subjects as the answer to individual needs and interests.

Broad-fields approach: An approach to curriculum developed as a possible answer to criticisms of subject-matter organization; attempts to reduce separateness of subjects and to blend related areas together.

Broad-fields course: A course in which traditionally separate subjects have been fused into a general course; stress being placed on the inter-relationships of the subjects combined.

Child-centered curriculum: A curriculum in which the criteria for the selection and sequence of materials, activities, and experiences for any particular pupil are the needs, maturity, interests, and experiential background of the individual learner.

Core curriculum: A curriculum in which all or some of the subjects or courses are based on a central theme in order to correlate the subjects and the theme.

Core Program: A program generally characterized by extended periods of time and by a fusion or interrelatedness of subject matter from more than one area of knowledge. One of the main characteristics of a true core program is its goal of focusing the study around learner interests and the real problems of living.

Correlated curriculum: A curriculum that systematically attempts to point out associations, reciprocal relations, and connections by

(a) incidental references and isolated projects
(b) simultaneous treatment of the identical or related topics in different courses
(c) the fusion of courses into an integrated course (the term integrated curriculum here preferred)

Departmentalization: The division of the school organization into disciplinary departments, with each teacher responsible for teaching one or more subjects within the given discipline.

Departmentalized approach: Traditionally, the same as the subject-oriented (or centered) curriculum.

Disciplinary approach: The same as subject-oriented (or centered) curriculum.

Discipline: A discipline is a body of knowledge organized around basic concepts. Each discipline has its particular approaches, tools, and methods for discovering and ordering information.

Fragmentation: A term used to indicate the opposite of wholeness. With fragmentation there is a tendency for meaning and things to occupy separate and isolated domains.

Fused curriculum: A curriculum in which a combination of courses replace a number of subjects previously offered in one or a number of different fields and drawing heavily on the replaced subject matter for content.

Integrated curriculum: A curriculum in which subject matter boundaries are ignored, all offerings of the school being taught in relation to broad areas of study and in relation to one another as mutually associated in some genuine life relation.

Interdisciplinary approach: An approach combining two or more academic disciplines or fields of study.

Self-contained classroom: A classroom where all disciplines are taught to the same group of learners by the same teacher; generally utilizes all resources within room.

Subject-oriented (or centered) curriculum: A curriculum in which the learning activities and content are planned within organized fields of knowledge or subjects. Essentially the same as the traditional departmentalized and disciplinary approaches.

Thematic curriculum: A curriculum pattern organized around the social processes of life functions of man, with emphasis upon the close relationship between its content and life; draw heavily upon traditional subject-matter content to accomplish its aims.

Operational Definitions

The definitions which follow are presented herein as this paper's operational definitions of the terms, "interdisciplinary approach" and "disciplinary approach". These definitions were derived from a synthesis of all preceeding sections. The only difference between the two is whether one or more than one discipline is involved.

> An <u>interdisciplinary approach</u> is a means of achieving an objective in which the persons or person seeking the objective interrelate(s) and applie(s), consciously or unconsciously, the knowledge, methods, materials, and/or apparatus of more than one discipline.
>
> A <u>disciplinary approach</u> is a means of achieving an objective in which the persons or person seeking the objective interrelate(s) and applie(s), consciously or unconsciously, the knowledge, methods, materials, and/or apparatus of no more than one discipline.

The objective seeker using either of the above approaches could be an institution, its staff, a group of people of assorted specialties, an instructor or manager of learning, a learner; for that matter, any group or individual anywhere wishing to achieve an objective or solve a problem.

For determining the relative degree of "interdisciplinariousness" or of "disciplinariousness" in a given curriculum Activity A-1 outlined above is applicable. A learning hierarchy starting with the educational goals of the institution under consideration needs to be established. Instructional objectives related to the educational goals also need to be established or adopted for the areas under consideration. The next step is the structural analysis of the

principles involved. Common concepts or commonalities must be categorized by disciplines. The total commonalities within a given area of concentration (curriculum, discipline, subject, course, theme, or principle) represents the possibilities for interrelatedness or "interdisciplinariousness". The actual number of times a commonality is employed, either for interpretive or performance purposes, must be surveyed and recorded. The actual and total number of times all commonalities are employed divided by the total possibilities provides an index of "interdisciplinariousness". The closer the index figure approaches 1.00 or totality, the more interdisciplinary that area is said to be. The farther the index figure deviates below 1.00 or totality the more disciplinary the area is said to be. For example, operationally, a school using an interdisciplinary approach would be one which would score high on the interdisciplinary-disciplinary scale.

Delimitation

Operationally, the remainder of this paper is limited to Activity A-2 above. People who are involved with the "interdisciplinary approach" are conscious of the fact and willingly acknowledge that common concepts and generalizations do exist. In educational practices they apply concepts and principles common to the various disciplines or knowledge structures. They transfer meanings freely from one discipline to another for both interpretive and performance purposes. Processes tend to perpetuate the principle that

"everything, including matter and ideas, is interfunctionally related" in some manner.

Broad-field approaches, child-centered, core, correlated, cross-disciplinary, fused, integrated, interdisciplinary, inter-related, poly-discipline, non-departmentalized (or non-compartmentalized), self-contained, thematic, and trans-disciplinary programs are herein considered to possess sufficient qualities of "interdisciplinariousness" to be deemed valid sub-areas for researching and drawing upon. Most of these terms have been defined in the Definition of Terms section of this paper.

Furthermore, since this paper is particularly concerned with what the literature has to say about the comparative effectiveness of "interdisciplinariousness", before proceeding further some suggested criterion, or criteria, for measuring this effectiveness must be indicated. Actual behavioral change seems to be the most quantitative and quantified. Therefore, evidence of behavioral change will be sought. Some rather specific and measurable characteristic change factors or variables follow. Very possibly others, closely related to these, may be disclosed in the process of reviewing the literature.

Self-reliance
- academic achievement
- concept of self
- confidence level
- dependence level
- know-how
- physical ability
- rational thinking
- responsibility
- skill

Productivity
- assertion level
- competence level
- construction and production
- expression
- goal orientation
- problem solving capabilities
- self-direction
- self-motivation
- synthesizing capabilities

Autonomy
- self-control
- self-governing
- self-guidance
- self-regulating
- value selection

For information at this point: self-reliance, productivity, and autonomy were stated earlier in this paper as the educational goals of the interdisciplinary approach.

Review of the Literature

The following review, with the exception of two definitive studies cited (Core; Gardner, 1958; Watrous, 1956), includes those studies found to be applicable to the third possibility: skepticism. Many of the certified staff members have had experience either in self-contained classrooms or in departmentalized programs. Most have been trained for one or the other. Documented evaluative data which would tend to indicate, or actually show, that the interdisciplinary approach is any more effective---or vastly different---than the programs for which these members came has not been presented to them. A review of the research which has been done in areas related to the "interdisciplinary approach" may serve to convince and commit; or may serve to convict and evict.

Very little empirical data specifically pertaining to the "interdisciplinary approach" and identifying it as such could be found. However, as mentioned elsewhere in this paper, some other approaches contain enough degrees of "interdisciplinariousness" to be considered related. This relatedness with its concomitant similarities has helped in "zeroing in" on the three assumed possibilities or problem ramifications. Also it has engendered some tentative statements which could promote implementing and evaluating the "interdisciplinary approach" in the local setting.

Child-centered and subject-centered compared

(Jennings, 1968) No significant difference was found when an attempt was made to verify or refute the view which holds that classes emphasizing student-teacher planning of course,content, self-evaluation, interaction among students (student centered) contribute more toward a positive self-concept than does the subject-centered approach. Bill's Index of Adjustment and Values was the instrument used to evaluate the learners in five junior high schools.

Selected for curriculum examination were 151 core classes, including 4,248 students.

Core: Clarification

(Gardner,. 1958) The original meaning of the term, "core" was characterized by specific course requirements. This meaning was modified in the curriculum reorganization movement of the 1930's

and the first part of the 1940's. Background and clarification were presented by Gardner.

Learning must be based upon the premise that experience modifies behavior. The learner is deliberately lead into preplanned life-problem areas where both teachers and learners are free to cut across subject matter lines as needed to deal with the various aspects.

Clarification was evolved by the use of a developed checklist which was eventually submitted to a jury of experts in the field of core curriculum. The results served to clarify the meaning.

Core: Characteristics

(Blackburn, 1962) Understanding self and value selection were two of five areas chosen as being the most important for inclusion in a junior high school core program. The selection was made by a jury of educators composed of the members of the Association for Supervision and Curriculum Development's Commission on Core Teaching. Use of problem solving techniques was identified as one of the characteristics of the core program. The position taken held that the scope of a core program should be organized in terms of real life problems. A learning activity approach suggesting 597 possible learning activities was presented. Six criteria for the selection of these learning activities were developed and listed.

Core Programs: Justification and Rationale

(Faunce, 1947) The somewhat limited evalutive data showed that the core program is relatively effective. Students appeared to have "held their own" in respect to conventional goals of instruction while making important gains in personal-social adjustment and citizenship. They tended to like school better, remain in school longer, and understand their own growth better. The students in six high schools and in two junior highs were surveyed.

Core and non-core Compared

(Gale, 1955) The progress of students and graduates of a core program were evaluated. Academic achievement and certain aspects of the personal social adjustment were among the variables considered in the comparison of the core and non-core students. The samples were randomly selected and equated on the basis of sex, curriculum, year of graduation, and intelligence.

The data revealed that the core students had achieved statistically significant gains in basic English skills, in the mastery of subject matter in American history, biology, and American literature; in the fundamental concepts and attitudes involved in effective citizenship; and in personal and social adjustment. Comparative analysis of the core graduates and non-core graduates showed no significant differences in grades achieved in English, biology, and social sciences; to scores on College Board Entrance Examinations; to class ranks at the twelfth grade level; to membership in the

National Honor Society, to participation in extracurricular activities; to teacher's ratings; and to academic grades during the first semester's attendance at college. However, core graduates were more satisfied with their academic experiences than were non-core.

(Jurjevich, 1956) The core group's academic achievement surpassed the comparison group in the junior high. Their behavior indicated that they were active, participating members of the school community and readily assumed control over their own behavior.

(Schwartz, 1958) The hypothesis that high school students have learned more through a core program in the junior high school and therefore exhibit a more favorable attitude toward various aspects of school life as measured by a standardized student attitude scale is rejected.

(Luecking, 1956) Learners who have been prepared in a core program in grades six, seven, and eight do at least as well as those prepared for high school in a non-core, or subject centered program. Pupil growthwas appraised by means of standardized tests, observations of behavior, and representative samples of their work. The normal grade-equivalent gain expected on the MAT between September 1951 and May 1954 was 2.7. The median grade equivalent gain exceeded this in most subject areas. The core group showed a somewhat greater median and mean growth than did the non-core group.

Core and Subject Centered Curriculum Compared

(Davis, 1956) Value formulation, scientific thinking, and acquisition of subject matter were among the variables used to determine the effectiveness of a core program. This study measured the growth of a twelfth grade core group during the preceeding three year period. Net growth toward the curriculum objectives was ascertained through a status measurement comparison with a comparable ninth grade core group within the same school. Two control groups were organized from the ninth and twelfth grades of a secondary school with a subject-centered curriculum, which was located within the same attendance area. The four groups were comparable to each other on the following control factors: intelligence, sex, chronological age, father's education, mother's education, siblings, religious preference, parents' occupation, dwelling area, background of father and mother, and achievement pre-testing. This study tested the hypothesis that the differences in net gains between the experimental and control twelfth grade groups toward the selected objectives were attributed to the core curriculum.

The following tests were used in determining the similarity of the groups and to measure learner progress toward the objectives: The American Council on Education Psychological Examination of High School Students, The Cooperative Achievement Tests in English, Social Studies, Mathematics, and Natural Science, the Watson-Glaser Test of Critical Thinking, and the Mental Health Analysis, Secondary Series.

Among the conclusions were these: no difference existed between experimental and control groups in the aquisition of subject matter, or academic achievement and no difference existed in scientific thinking or problem solving capability. The experimental group as a whole did not show evidence of progress in the area of value formulation.

Correlated Classes

(Watrous, 1956) The evaluation results showed that students in the correlated classes of English and social studies achieved academically as well or better in these areas as did students in non-correlated subject-oriented classes.

Departmentalized Compared with non-departmentalized

(Del Gaudio, 1970) The possibility of significant difference in the academic achievement of students exposed to departmentalized instruction in reading and arithmetic compared to the students exposed to non-departmentalized instruction at the seventh and eighth grade levels was studied. No difference could be found. Included were thirteen elementary schools containing 7th and 8th grades. Six were departmentalized. The Iowa Basic Skills Test was administered twice to both groups, two years apart. The resulting gains and/or losses in academic achievement based on the second test score were used to determine the relative effectiveness of the two programs.

Integration

(Remick, 1965) Involvement was the factor to which higher individual achievement by the learners in an experimental group was attributed. The study investigated a curricular program which was designed to aid the learner in the integration of theories, concept, and principles of science and industry. To compare the relative effectiveness of the integrated and non-integrated approaches 70 randomly assigned students were placed in experimental and control groups. Initial comparison of these groups was based upon data compiled from cumulative records and scores recorded from STEP, Form 3A. Data was treated by using "t" and "F" tests. Tests revealed no significant differences at the beginning. Control group was taught the traditional science; experimental group, the integrated. Comparison of academic achievement and ability to apply theory to practical situations were made at the conclusion of the study. Form 3B (STEP) showed the mean score of the experimental group was significantly greater. Teacher tests contributed to an arrival at the same conclusions. The integrated course allowed for flexibility of instruction, involved individual research and incorporated manipulative activities.

(Marshall, 1955) Children exposed to integrated programs exhibit willingness to explore a wider choice of resources for material and methods in solving their problems. The aims and objectives of both core and physical education were compared in the light of human development principles. The evaluation was a type of action research with 7th grade students.

(Hallquist, 1968) In an experimental study to correlate music and geography, learners in the experiential groups scored higher in achievement than did those in the control groups. Eight randomly selected sixth grade classes were used. Variables other than achievement were also being tested. All data was processed by computer using a linear regressive technique.

(Champion, 1965) Though not included in the study's initial list of variables, interest and motivation were among the factors cited as sufficiently enhanced so as to render an integrated elementary science-industrial arts unit valid as a model for curriculum implementation. Evaluation was based on the results of a unit examination, records of out of class activities reported by the students, and professional judgement of the classroom teachers. Comparability between the control and experimental classes was based on chronological age, I.Q., reading level, and a general science test used as a pre-test. The measuring instrument was constructed in two parts: a science section and an industrial arts section. The industrial arts portion was designed to reflect the student's ability to understand and generalize upon practical applications.

Self-Contained and Departmentalized Compared

(Grooms, 1967) To determine the effects of two organizational plans---self-contained and departmental---upon learner achievement

and social adjustment, data were collected by administering a pre- and post-test in mathematics, social studies, language arts, and science to fourth, fifth, and sixth graders. The Metropolitan Intermediate Achievement Test was used for measuring achievement and the social adjustment evaluative instrument was one developed by Bledsoe: i.e., Real and Ideal Concept Scales and Manifest Anxiety Scale.

In language arts, pupils in the control (self-contained classrooms) school made greater gains in spelling, language study skills, language total and work knowledge than did pupils in the experimental (departmental) school. No significant difference in reading achievement was found to exist between the pupils in the two schools. In social studies, no significant difference in achievement was found in the information sub-area, but the self-contained group was higher in social skills application. In mathematics, pupils of grades five and six of the self-contained group were higher; no significant difference for fourth graders. In science, no significant difference was found. In the self-concept analysis, no significant difference was found.

(Garthwaite, 1965) A difference of opinion continues to persist regarding the relative effectiveness of the self-contained classroom and the special art room as physical settings for conducting an elementary art program. An endeavor was made to determine whether there are significant differences in attitude toward art and art

performance between groups of sixth grade pupils in the two settings.

Subjects for an experimental and a control group were randomly selected. No significant difference was found to exist between the two groups with reference to the following categories: esthetic quality, creative imagination, spontaniety, performance and attitude toward subject.

(Malone, 1965) Tests of significance at the 5% level showed that there was no significant difference between departmental and self-contained programs in several respects including academic achievement in any area measured. This finding of no difference concluded that neither pattern of organization was superior to the other so far as academic achievement was concerned. The progress of 163 sixth grade pupils in the two patterns were evaluated by means of the Iowa Tests of Basic Skills. The Linquist Type III Mixed Design was used for the analysis.

(Roller, 1970) Academic achievement in the areas of social studies, science, language arts, mathematics, and reading was the change-factor variable considered in a study made to compare the effectiveness of a semi-departmental classroom organization with that of a self-contained classroom. A representative selection of 75 percent of all pupils enrolled in grades four through six in a selected elementary school in the first year of the study, constituted the control group. These pupils were heterogeneously grouped and completed the year in a self-contained classroom. These same pupils,

who were then in grades five through seven during the second year of the study, comprised the experimental groups in a semi-departmentalized classroom.

A comparison of achievement was made by the use of the correlated "t" test. It was found that the differences between the mean scores obtained in the fall and those obtained in the spring of the first year of the study were significant at the .05 level of confidence for all subject-matter areas tested, with the exception of social studies in Group C. The differences between the mean scores obtained in the fall and those obtained in the spring of the second year of the study for all subject-matter areas tested were significant at the .05 level of confidence, with the exception of social studies for Group A, reading for Group B, and social studies and science for Group C.

As measured by standardized achievement tests, academic achievement of the learners in the semi-departmentalized classroom was not superior to that of the learners in the self-contained classroom.

(Selee, 1964) Academic achievement was one of the variables employed to determine experimentally whether significant differences do exist between the modified departmental classroom as opposed to the modified self-contained classroom. Subjects were the fifth grade pupils in six classes, three each in two different schools. Three teachers taught three subjects each to the classes in the experimental or modified departmental group. Art, music, and physical education

were taught by specialists. In the control group or modified self-contained classroom the teachers taught all subjects except art, music, and physical education, which were taught by specialists.

The Otis Mental Abilities Tests showed no significant difference between groups so far as intelligence was concerned. A pre-test and post-test on the Ayres Handwriting Scale and an initial and a final test on the California Achievement Test Complete Battery were used for data gathering. The scores on these tests were subjected to statistical treatment of analysis of covariance to control initial differences.

The data showed a significant difference in gain at both the five and one percent levels in favor of the control group in the language and arithmetic sub-tests. The data also showed a significant difference at both levels in favor of the experimental group in the reading sub-test. Hand-writing and spelling sub-tests indicated no significant difference in the two groups. Treated as a whole, with achievement gains in both directions, no significant difference is apparent.

(Sackett, 1971) The self-contained and departmentalized programs are not significantly different in achievement. However, the achievement levels in both were significantly greater than that of the open-space type programs. Also, the self-concept mean score for the sixth grade students in the open-space school tested was significantly lower than the self-concept mean score for students

in both the self-contained classrooms and the departmentalized programs. The school selected for the study was specifically designed to fit a curriculum geared to team teaching and open space. It was heavily oriented toward a humanistic approach to education and maximum freedom for exploration.

Neighboring elementary schools were selected for comparison: one with conventional grade levels and self-contained; the other with conventional grade levels and departmentalized. A Self-Esteem Inventory, the Lorge-Thorndike Intelligence Test, and the Iowa Tests of Basic Skills were administered. An Analysis of Variance of the scores from each of the sixth grade students in the three schools involved was computed. An analysis of the mean I Q scores for the three groups established the fact that the groups were drawn from the same population with respect to this factor.

Thematic Approach

(Blane, 1967) Thematic material in which concept attainment tasks are embedded shows no evidence of significantly affecting instruction or test concept attainment performances. This conclusion is based on the lack of significant differences found in instructional and performances between those instructed on non-thematic tasks and those instructed on thematic tasks.

Fifty sixth grade children from two public schools were matched on the following variables: intelligence, area, race, and social

class membership. Children were assigned randomly by sex to five groups each of which had five male and five female members. Instructional treatments (no instruction, Bruner-maximum, TCAT-2 minimum, Bruner-maximum, and TCAT-2 maximum) were then randomly assigned to the groups.

Bruner's concept task was used in modified form. Two thematic concept tasks were constructed logically parallel to Bruner's task but differing by containing considerable thematic content. All tasks had two attributes of two values each and two of three values each. The stimuli were contained in 36-stimulus array boards. The criterion for concept attainment was the number of stimuli encounters to correct verbalization of the concept. All children worked individually with the researcher and received task familiarization before achieving the instruction concept and then being tested on a second concept.

(Reising, 1969) Adolescents, both male and female, generally gain greater enjoyment and profit from their literary experiences if they probe a theme in literature rather than study literary materials of little or no intrinsic importance to them. Forty-seven literary selections representing twelve sports provided for an investigation of all five major literary forms: the essay, the poem, the short story, the novel, and the drama.

Summary

Since the days of the early Greeks and Romans, Western culture, at least, has been subjected to the "disciplinary-interdisciplinary" controversy. The inherent philosophies of the two approaches then are nothing new: on the one hand, and in its extreme form, knowledge of and about phenomenon exist of and for itself--in isolation; on the other hand, and in its extreme form, knowledge is infinitely interrelated to other knowledge (method, materials, and apparatus included). Historically, a number of different terms have been used to differentiate organizational commitment to either. "Disciplinary" approaches include: subject-centered, subject-oriented, departmental, and non-core. "Interdisciplinary" approaches include: student-centered, student-oriented, non-departmental, core, self-contained, integrated, and correlated. The literature reviewed showed repeatedly that type of organizational structure, when viewed traditionally (i.e., when the school's primary goal was concerned with academic achievement), does not make a difference in academic achievement. Generally, the self-concept of learners who were exposed to the interdisciplinary approaches was higher than those who were exposed to the disciplinary approaches. The former were found to be more independent, more assertive, more self-motivated, more enthusiastic, more interested and more involved than the latter. The former did better and used more varied approaches to problem solving. Also they made better use of their available resources.

Tentative statements based upon the above synthesis follow:

1. The interdisciplinary approach cannot be justified on the basis of academic achievement. (no more; no less)

2. The interdisciplinary approach can be justified on the basis of personal involvement.

Implications for Professional Behavior

The interdisciplinary approach has one definite advantage over the disciplinary approach: the attitude which prevails when one is actively involved in seeking a personal goal or satisfying a real need, and doing so by using all of one's resources without restriction. Since the findings have indicated that learners do as well in academic achievement, yet have a more favorable attitude toward school, and themselves, pursuit of the "interdisciplinary approach" is recommended. Educators who accept this recommendation must:

1. Nurture the following concepts:
    1. composition
    2. harmony
    3. organization
    4. relatedness
    5. unistructure
    6. unity
    7. wholeness

2. Identify institutional goals and instructional objectives
   Identify principles to be used in reaching goals
   Identify concepts within principles
   Identify concepts common to other disciplines
   Interrelate concepts when presented to learner
   Consider methods of other disciplines as strategy for problem solving
   Consider materials and apparatus of other disciplines as resources

3. Instill 1 and 2 above in the minds of the learners.

4. Refer to the section on Activity Analysis, page 9, above.

Recommendations for Future Research

In order to solidify or modify the stated implications the following questions are recommended for future research:

1. Is there a subject taught which does not have some degree of "interdisciplinariousness"? According to the operational definition of this paper?

2. Can a departmentalized classroom be interdisciplinary? And still be considered departmentalized?

3. Generally, is the self-contained classroom"interdisciplinary" ?

4. Is fragmentation of content a problem with all learners? If not, at what level of intelligence does it cease to be a problem?

5. Do self-reliance, productivity, and autonomy reduce one's need for others? If it does, is this reduction desirable?

6. Can self-reliance, productivity, and autonomy be quantified and definitely measured?

7. What effect does a new name have upon the acceptance or rejection of an old idea? What is the effect of biasness?

8. What are the relationships between synthesis, creativity, and transfer?

9. Can synthesis, creativity, and transfer be quantified and definitely measured?

10. Is creativity a misnomer?

11. Is the "interdisciplinary approach" a synthesizing process?

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